

<b>Taxon:</b> <i>Moringa arborea</i> Verdc.	<b>Family:</b> Moringaceae
<b>Common Name(s):</b> moringa	<b>Synonym(s):</b>

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 31 Jan 2022
<b>WRA Score:</b> -1.0	<b>Designation:</b> L	<b>Rating:</b> Low Risk

**Keywords:** African Tree, Rare, Medicinal Uses, Full Sun, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		

Qsn #	Question	Answer Option	Answer
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat		
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation		
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m <sup>2</sup> )		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

**Supporting Data:**

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Boopathi, N. M., & Abubakar, B. Y. (2021). Botanical Descriptions of <i>Moringa</i> spp. In <i>The Moringa Genome</i> (pp. 11-20). Springer, Cham	[No evidence] "Allan Radcliffe-Smith and Peter Bally have documented yet another <i>Moringa</i> species, <i>Moringa arborea</i> Verdcourt., in 1972, which was grown as a single tree on a rocky canyon in northeastern Kenya near the Ethiopian border. The tree bears clusters of pale pink and wine-red flowers throughout the year and almost it covers the entire tree. The pods or young fruits look like a yard-long string bean. Kenyans and Ethiopians use the roots of this species (which are thick, fleshy and pungent-smelling) as a medicine."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. <i>Kew Bulletin</i> 40(1): 1-23	"KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m, 21Jan. 1972, Bally & Radcliffe-Smith 14932 (holotype K; isotype EA)."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 31 Jan 2022]	"Native Africa EAST TROPICAL AFRICA: Kenya"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 31 Jan 2022]	

203	Broad climate suitability (environmental versatility)	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	"KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m, 21Jan. 1972, Bally & Radcliffe-Smith 14932 (holotype K; isotype EA)." [No evidence. Limited distribution]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Boopathi, N. M., & Abubakar, B. Y. (2021). Botanical Descriptions of <i>Moringa</i> spp. In <i>The Moringa Genome</i> (pp. 11-20). Springer, Cham	"Allan Radcliffe-Smith and Peter Bally have documented yet another <i>Moringa</i> species, <i>Moringa arborea</i> Verdcourt., in 1972, which was grown as a single tree on a rocky canyon in northeastern Kenya near the Ethiopian border."
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	"KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m, 21Jan. 1972, Bally & Radcliffe-Smith 14932 (holotype K; isotype EA)."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	Notes
	Boopathi, N. M., & Abubakar, B. Y. (2021). Botanical Descriptions of <i>Moringa</i> spp. In <i>The Moringa Genome</i> (pp. 11-20). Springer, Cham	"Allan Radcliffe-Smith and Peter Bally have documented yet another <i>Moringa</i> species, <i>Moringa arborea</i> Verdcourt., in 1972, which was grown as a single tree on a rocky canyon in northeastern Kenya near the Ethiopian border."
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	"KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m, 21Jan. 1972, Bally & Radcliffe-Smith 14932 (holotype K; isotype EA)."

301	Naturalized beyond native range	n
	Source(s)	Notes
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	
	<b>Source(s)</b>	<b>Notes</b>
	Navie, S. & Csurhes, S. (2010). Weed Risk Assessment. Horseradish tree. <i>Moringa oleifera</i> . The State of Queensland, Department of Employment, Economic Development and Innovation	[Regarded as a minor weed] "This species is regarded as potentially invasive or moderately invasive in tropical regions of the world. It has escaped from gardens in northern Australia, and is currently naturalised in north Queensland and northern Western Australia. Currently, it is considered a minor weed in northern Australia, but its status may change over time. <i>Moringa oleifera</i> appears to spread relatively slowly, eventually forming dense thickets around parent trees. Like other tree species with similar ecological characteristics, it may pose a long term threat to certain natural ecosystems in the wet/dry tropics of northern Australia. The large scale commercial cultivation of this species might accelerate the rate of naturalization and population development in northern Australia."

401	Produces spines, thorns or burrs	n
	<b>Source(s)</b>	<b>Notes</b>
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	[No evidence] "Arbor 15 m alta, cortice griseo laeve obtecta; ramulis brunnei, glabri, cicatricibus $\pm$ 7 mm diametris ornati." [Translation from Latin: Tree to 15 m., with smooth grey bark; shoots dark brown, glabrous, 8-10 mm. wide with round leaf-scars $\pm$ 7 mm. in diameter.]

402	Allelopathic	
	<b>Source(s)</b>	<b>Notes</b>
	Hossain, M. M., Miah, G., Ahamed, T., & Sarmin, N. S. (2012). Allelopathic effect of <i>Moringa oleifera</i> on the germination of <i>Vigna radiata</i> . Intl. J. Agri. Crop Sci, 4(3): 114-121	[Unknown. Allelopathic properties documented in <i>M. oleifera</i> ] "Abstract: The objectives of the study were to examine the allelopathic effect of different concentrations of leaf, root, bark, fruit kernel and seed aqueous extracts of <i>Moringa oleifera</i> on the germination of <i>Vigna radiata</i> ... The inhibitory effect of leaf, fruit kernel and seed aqueous extracts were almost similar, while those were relatively less than bark and root extracts. The effects of light and dark conditions on the rate of germination were not distinct. Therefore, the study revealed that allelochemicals released from different plant parts of <i>M. oleifera</i> impeded the rate of germination in laboratory condition."

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed ]	"Tree to 15 m., with smooth grey bark; shoots dark brown, glabrous, 8-10 mm. wide with round leaf-scars ± 7 mm. in diameter. " [No evidence. Moringaceae]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Boopathi, N. M., & Raveendran, M. (2021). Moringa and Its Importance. In <i>The Moringa Genome</i> (pp. 1-9). Springer, Cham	"Table 1.3 Benefits of Moringa in Human Health" ... "Leaf powder or extract is used as a nutrient supplement to the human staple food besides fodder and feed supplement to livestock animals."
	Van Wyk, B. & Van Wyk, P. (1997). <i>Field Guide to Trees of Southern Africa</i> . Struik Publishers, Cape Town, South Africa	[Other species are palatable] "The leaves and fruit are browsed by elephant, giraffe and springbok. Bark, wood, and root eaten by small stock and porcupine. Root edible, but sour-tasting."
	WRA Specialist. (2022). Personal Communication	Palatability unknown, but other species are browsed or grazed by animals

405	Toxic to animals	n
	Source(s)	Notes
	Quattrocchi, U. (2012). <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. (2008). <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Boopathi, N. M., Raveendran, M., & Kole, C. (2021). <i>Moringa and Its Genome: Future Prospects</i> . In <i>The Moringa Genome</i> (pp. 181-185). Springer, Cham	[Possibly. Generic description of pests and pathogens] "Furthermore, global Moringa production also experiences the following hurdles, which seriously affects the Moringa leaf or biomass production: (i) non-availability of suitable cultivars that are adapted to the local environment, (ii) occasional incidence of pests (for example, budworm (Noorda Moringae), leaf caterpillar (Noorda blitealis), hairy caterpillar (Eupterote mollifera), fruit fly (Gitonadi stigmata) and tea mosquito bug (Helopeltis theivora) are found to be devastating pests in Southern India), and (iii) diseases (examples of diseases that occur in Moringa includes brown leaf spot (Cercospora moringicola), septoria leaf spot (Septoria lycopersici Speg.), alternaria leaf spot (Alternaria solani Sorauer), powdery mildew (Leveillula taurica Lev. Arn.), root rot (Diplodia sp.), fusarium wilt (Fusarium oxysporium f. sp. Moringae), fusarium wilt (Fusarium oxysporium f. sp. Moringae), fruit rot (Cochliobolus hawaiiensis Alcorn), damping off (Rhizoctonia solani Kuehn), dieback (Fusarium semitectum Berk), anthracnose (Colletotrichum chlorophyti Chandra), twig canker (Fusarium pallidoroseum Cooke Sacc.) and rust (Puccinia Moringae Koorders))."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	The National Gardening Association. (2022). <i>Moringa arborea</i> . <a href="https://garden.org/plants/view/651709/Moringa-arborea/">https://garden.org/plants/view/651709/Moringa-arborea/</a> . [Accessed 31 Jan 2022]	"Edible Parts: Leaves Roots Seeds or Nuts"
	Boopathi, N. M., & Raveendran, M. (2021). <i>Moringa and Its Importance</i> . In <i>The Moringa Genome</i> (pp. 1-9). Springer, Cham	[No evidence] "Table 1.3 Benefits of Moringa in Human Health" ... "Leaf powder or extract is used as a nutrient supplement to the human staple food besides fodder and feed supplement to livestock animals."
	Quattrocchi, U. (2012). <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. (2008). <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	<p>Luke, W.R.Q., Musili, P., Sileshi Nemomissa, Barasa, J. &amp; Mathenge, J. (2021). <i>Moringa arborea</i> (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T32641A208224673.  <a href="https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en">https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en</a>. [Accessed 31 Jan 2022]</p>	"This tree grows in dried out riverbeds." [Fire ecology unknown]

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	"in dried out river-bed" [Presumably an open, high light habitat]
	<p>The National Gardening Association. (2022). <i>Moringa arborea</i>.  <a href="https://garden.org/plants/view/651709/Moringa-arborea/">https://garden.org/plants/view/651709/Moringa-arborea/</a>. [Accessed 31 Jan 2022]</p>	"Sun Requirements: Full Sun"
	<p>Bihrmann's Caudiciforms. (2022). <i>Moringa arborea</i>.  <a href="http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp">http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp</a>. [Accessed 31 Jan 2022]</p>	"Sun: Maximum"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	<p>The National Gardening Association. (2022). <i>Moringa arborea</i>.  <a href="https://garden.org/plants/view/651709/Moringa-arborea/">https://garden.org/plants/view/651709/Moringa-arborea/</a>. [Accessed 31 Jan 2022]</p>	"Soil pH Preferences: Neutral (6.6 – 7.3) Slightly alkaline (7.4 – 7.8) Moderately alkaline (7.9 – 8.4)"
	<p>Bihrmann's Caudiciforms. (2022). <i>Moringa arborea</i>.  <a href="http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp">http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp</a>. [Accessed 31 Jan 2022]</p>	"Soil: Mix"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	<p>[No evidence] "Arbor 15 m alta, cortice griseo laeve obtecta; ramuli satis brunnei, glabri, cicatricibus ± 7 mm diametris ornati."            [Translation from Latin: Tree to 15 m., with smooth grey bark; shoots dark brown, glabrous, 8-10 mm. wide with round leaf-scars ± 7 mm. in diameter.]</p>

412	Forms dense thickets	n
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	"KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m" [No evidence, but very limited natural distribution]



Qsn #	Question	Answer
	<p>Luke, W.R.Q., Musili, P., Sileshi Nemomissa, Barasa, J. &amp; Mathenge, J. (2021). <i>Moringa arborea</i> (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T32641A208224673.  <a href="https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en">https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en</a>. [Accessed 31 Jan 2022]</p>	<p>"This species is native to Kenya and Ethiopia. In Kenya, the species has been found only once in a site south-east of Malka Mari. It is also only known from one specimen in Ethiopia. The limited occurrences of this species causes it to have an area of occupancy of only 8 km<sup>2</sup>, measured using a standard 4 km<sup>2</sup> (2 x 2 km) grid." [No evidence within limited distribution]</p>

501	Aquatic	n
	Source(s)	Notes
	<p>Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23</p>	<p>[Terrestrial] "KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m,"</p>

502	Grass	n
	Source(s)	Notes
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a>. [Accessed 31 Jan 2022]</p>	<p>Moringaceae</p>

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	<p>USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a>. [Accessed 31 Jan 2022]</p>	<p>Moringaceae</p>

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	<p>Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23</p>	<p>"Arbor 15 m alta, cortice griseo laeve oblecta; ramuli satis brunnei, glabri, cicatricibus ± 7 mm diametris ornati." [Translation from Latin: Tree to 15 m., with smooth grey bark; shoots dark brown, glabrous, 8-10 mm. wide with round leaf-scars ± 7 mm. in diameter.]</p>

601	Evidence of substantial reproductive failure in native habitat	
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Luke, W.R.Q., Musili, P., Sileshi Nemomissa, Barasa, J. &amp; Mathenge, J. (2021). <i>Moringa arborea</i> (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T32641A208224673.  <a href="https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en">https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en</a>. [Accessed 31 Jan 2022]</p>	<p>[Unknown] "<i>Moringa arborea</i> is a tree native to Kenya and Ethiopia. This species is rarely collected and as such current area of occupancy estimate is only eight square kilometers. There is no information available on threats to the species and little information on the species ecology. It is here assessed as Data Deficient until further information is collected."</p>

602	Produces viable seed	y
	Source(s)	Notes
	<p>Bihrmann's Caudiciforms. (2022). <i>Moringa arborea</i>. <a href="http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp">http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp</a>. [Accessed 31 Jan 2022]</p>	"Propagate: Seeds/Cuttings"
	<p>POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a>. [Accessed 31 Jan 2022]</p>	"Seeds greenish; body ellipsoid-trigonous, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide. "

603	Hybridizes naturally	
	Source(s)	Notes
	<p>Olson, M.E. (2015). April flowers in the <i>Moringa</i> botanical garden. The International <i>Moringa</i> Germplasm Collection. Universidad Nacional Autónoma de México, México DF. <a href="http://www.moringaceae.org/">http://www.moringaceae.org/</a>. [Accessed 31 Jan 2022]</p>	[Hybridization documented in genus] "Flowers of a pretty and very vigorous <i>Moringa oleifera</i> X <i>Moringa concanensis</i> hybrid. They have the wide petals of <i>M. oleifera</i> and the pink streaks of <i>M. concanensis</i> "

604	Self-compatible or apomictic	
	Source(s)	Notes
	<p>Olson, M. E. (2003). Ontogenetic origins of floral bilateral symmetry in Moringaceae (Brassicales). <i>American Journal of Botany</i>, 90(1), 49-71</p>	"Little is known regarding breeding systems in <i>Moringa</i> , although <i>M. oleifera</i> is known to outcross and occasionally self (G. Muluvi, Kenya Forestry Research Institute, personal communication)."
	<p>East, E. M. (1940). The distribution of self-sterility in the flowering plants. <i>Proceedings of the American Philosophical Society</i> 82: 449-518</p>	[Unknown. Self-fertility reported in genus] " <i>Moringa oleifera</i> Lam. is self-fertile though slightly protandrous."

605	Requires specialist pollinators	n
	Source(s)	Notes
	<p>Verdcourt, B. (1985). A synopsis of the Moringaceae. <i>Kew Bulletin</i> 40(1): 1-23</p>	"The smooth pollen and narrow stylar canal opening down to the ovary cavity are striking characters particularly as the very sweet-scented flowers are clearly insect-pollinated." [Generic description]
	<p>Kubitzki, K. &amp; Bayer, C. (eds.). (2003). The Families and genera of vascular plants. Volume V. Flowering Plants. Dicotyledons: Capparales, Malvales and Non-betalain Caryophyllales. Springer Verlag, Berlin, Heidelberg, New York</p>	[Family description] "The sweet-scented flowers are clearly beepollinated, and nectar secretion seems to take place on the inside of the receptacle"

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Bihrmann's Caudiciforms. (2022). <i>Moringa arborea</i> . <a href="http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp">http://www.bihrmann.com/caudiciforms/SUBS/mor-arb-sub.asp</a> . [Accessed 31 Jan 2022]	"Propagate: Seeds/Cuttings"

607	Minimum generative time (years)	
	Source(s)	Notes
	Emongor, V. E. (2011). <i>Moringa</i> ( <i>Moringa oleifera</i> Lam.): a review. <i>Acta Hort.</i> 911, 497-508	[ <i>Moringa oleifera</i> capable of reaching maturity quickly] "Unlike most perennial trees, which have a juvenile period of 3-7 years before seedlings can flower, moringa can start flowering 3-8 months"
	WRA Specialist. (2022). Personal Communication	Unknown. Other species reported to flower in 3 or more years

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	"Seeds greenish; body ellipsoid-trigonus, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide." [No evidence. Seeds lack means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	Seeds sometimes available for purchase online from a limited number of websites

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	No evidence. Unlikely. Rare in cultivation and not grown with produce

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Kubitzki, K. & Bayer, C. (eds.). (2003). The Families and genera of vascular plants. Volume V. Flowering Plants. Dicotyledons: Capparales, Malvales and Non-betalain Caryophyllales. Springer Verlag, Berlin, Heidelberg, New York	"Dispersal for species with alate seeds is by wind" [General family description]
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	[Presumably yes. Winged-seeds] "Seeds greenish; body ellipsoid-trigonus, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide. "

Qsn #	Question	Answer
705	Propagules water dispersed	
	Source(s)	Notes
	Verdcourt, B. (1985). A synopsis of the Moringaceae. Kew Bulletin 40(1): 1-23	[Possibly. Distribution in river-bed suggests possible secondary movement by water] "KENYA. Northern Frontier Province: 42 km SE of Melka Murri airstrip and about 35 km WNW of Ramu, in dried out river-bed, 450m,"

706	Propagules bird dispersed	n
	Source(s)	Notes
	Kubitzki, K. & Bayer, C. (eds.). (2003). The Families and genera of vascular plants. Volume V. Flowering Plants. Dicotyledons: Capparales, Malvales and Non-betalain Caryophyllales. Springer Verlag, Berlin, Heidelberg, New York	"Dispersal for species with alate seeds is by wind" [General family description]
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	"Seeds greenish; body ellipsoid-trigonous, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	"Seeds greenish; body ellipsoid-trigonous, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide." [Unlikely. No means of external attachment]

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	"Seeds greenish; body ellipsoid-trigonous, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide." [No evidence. Winged seeds presumably adapted for wind dispersal]

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	POWO (2022). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. <a href="http://plantsoftheworldonline.org/">http://plantsoftheworldonline.org/</a> . [Accessed 31 Jan 2022]	[Numbers unknown] "Seeds greenish; body ellipsoid-trigonous, 1.7 cm. long, 1 cm. wide, slightly rugose, with 3 prominent wings separated by distinct sinuses; overall length of seed 5.5 cm. long, 1.6 cm. wide."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Boopathi, N. M., Harshith, J. D., Santhanakrishnan, V. P., & Raveendran, M. (2021). Tissue Culture and Genetic Engineering in Moringa. In <i>The Moringa Genome</i> (pp. 67-83). Springer, Cham	[Unknown, but possibly no based on generic storage data] "It should also be noted that Moringa seed lose its viability, if they are stored for more than 2 months. Sharma and Raina (1982) reported loss of Moringa seed germination at the rate of 50%, 48%, and 7.5% when they are sowed after 1, 2, and 3 months, respectively, of seed collection due to its high oil content (and also in certain cases, due to storage pest infestation). Thus, long-term storage of Moringa seeds critically affects the germination process, and hence, keeping the seeds even for the next season may have adverse effect on the germination."

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Luke, W.R.Q., Musili, P., Sileshi Nemomissa, Barasa, J. & Mathenge, J. (2021). <i>Moringa arborea</i> (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T32641A208224673. <a href="https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en">https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T32641A208224673.en</a> . [Accessed 31 Jan 2022]	[Unknown] "There is no information available on threats to the species and little information on the species ecology."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	Unknown

**Summary of Risk Traits:**

High Risk / Undesirable Traits

- Grows, and could spread, in regions with tropical climates
- Other *Moringa* species have weedy traits and tendencies
- Reproduces by seeds
- Seeds dispersed by wind, gravity and intentionally by people
- Limited ecological information may limit accuracy of risk prediction

Low Risk Traits

- No reports of invasiveness or naturalization, but no evidence of widespread introduction outside native range
- Unarmed (no spines, thorns, or burrs)
- Grows in high light environments (dense shade may inhibit ability to spread)
- Not reported to spread vegetatively